

A case report of successful survival after tracheal intubation and IMV in elderly patient of COVID-19 with hypertension

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Abstract

Coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus (SARS-CoV)-2 infection has become a pandemic cause of viral pneumonia. Elderly patients with chronic comorbidities are susceptible to SARS-CoV-2, and are more likely to have complications that can lead to severe or even fatal consequences. It is important to seek the appropriate effective treatment for these susceptible persons. Here we report a case of elderly COVID-19 patient with hypertension, which was a member of the familial cluster COVID-19 in Enshi City, Hubei Province, China. He successfully survived after removal of tracheal intubation and inhalation of the invasive mechanical ventilation (IMV). This report aims to provide an inspiration for the prevention and treatment of critical COVID-19 cases.

Introduction

Coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus (SARS-CoV)-2 infection has become a pandemic cause of viral pneumonia (Lescure FX et al, 2020; Wang C et al, 2020), leading to over 2 million cases with more than 146 thousands death up to April 18th, 2020. Studies have shown that pediatric patients present mostly mild and moderate cases (Qiu H et al, 2020). In contrast, Elderly patients with comorbidities are susceptible to SARS-CoV-2, and are more likely to have complications that can lead to severe or even fatal consequences (Chen N et al, 2020). SARS-CoV-2 is highly contagious, especially in the case of family cluster transmission (Chan JF et al, 2020). Early and effective isolation of diagnosed COVID-19 patients will reduce the chance of infection for other family members.

Here, we report a case of family cluster COVID-19 with high-risk characteristics: older age, history of hypertension, which successfully survived after removal of tracheal intubation and invasive mechanical ventilation (IMV) in Enshi City, Hubei Province, China. Due to the current poor prognosis of tracheal intubation and IMV in patients with COVID-19, the successful survival of this case has given great encouragement and confidence to clinicians and similar patients. We actively discussed the relevant content of this case with a view to inspiring the prevention and treatment of critical COVID-19 cases.

Case presentation

The patient was a 60-year-old COVID-19 male with hypertension who had undergone long-term contact with a confirmed COVID-19 patient (his father, who had passed away on Feb 10, 2020). He was admitted to the hospital in Enshi City as a moderate COVID-19 case on Feb 12, 2020 after initial diagnoses: productive coughing, positive SARS-CoV-2 nucleic acid test, and CT results (infectious lesions of the right and left lower

lobe, ground glass changes) (Figure 1A). Blood test displayed an increased neutrophil percentage (73.5%) and a decreased lymphocyte percentage (15.6%) (Table1). In view of continuous fever, Computed Tomography (CT) was reviewed on the 8th day (Feb 16, 2020). The image presented multifocal ground glass opacities with consolidation of significantly larger range and higher density compared to previous observations. In addition, there were several fibrous calcifications in the lungs (Figure 1B).

On the 12th day of admission, the patient developed dyspnea and a non-invasive mechanical ventilation (NIV) was used to assist breathing. On the 13th day, the patient's condition further deteriorated (SaO₂ 49.2%) (Table1). Tracheal intubation and invasive mechanical ventilation (IMV) were performed immediately, SaO₂ subsequently rose to 100%. After intubation, the patient developed a second-degree atrioventricular block of the heart and an increase in blood pressure (190/100 mmHg), which returned to normal after symptomatic treatment of atropine and sodium nitroprusside. Meanwhile, he continued to be treated for anti-infection, antiviral, nutritional support, stomach protection and correction of electrolyte disorders. On the 5th day after intubation (Feb 28, 2020), the patient's liver function became worse (ALT 239.0 U/L, AST 168 U/L and γ -GT 108 U/L) (Table 1). With the enhancement of liver protection treatment, patients' liver function did not deteriorate further.

On the 20th day, the patient was conscious. Tracheal intubation was removed and NIV was used to assist breathing (SaO₂ 100%). After the removal of intubation, CT re-examination showed ground glass opacities with consolidation in the lungs, the range was larger and the density of some lesions was higher than before (Figure 1C). On the 35th day the patient satisfied discharge criteria and was maintained in isolation. The last lung CT image showed that the lesion was absorbed compared to previous observations (Figure 1D). During the isolation period, treatments such as oxygen inhalation, liver protection, phlegm elimination, and anti-infection were continued. On Mar 22, 2020, patient SARS-CoV-2 IgG antibody tested positive.

Discussion

We report a critical COVID-19 case in Enshi City who successfully survived after tracheal intubation and IMV treatment. A 60-year-old patient, a history of hypertension, persistent recurrent fever after admission, the results of blood tests and CT results all indicated that he could progress to critical status (Shi H et al, 2020; Zhang G et al, 2020). Due to deterioration, NIV treatment was performed on Feb 23, 2020, but the breathing condition was not improved. The next day (Feb 24, 2020), tracheal intubation and IMV were performed. Subsequently, the breathing condition was greatly improved, after which the SaO₂ remained at 99-100%. We believed that early and timely assisted breathing interventions have played a better role in curbing the disease progression of this patient.

Hypertension and diabetes are reported to be the most common comorbidities of COVID-19, followed by cardiovascular disease (Huang C et al, 2020; Wang D et al, 2020). Wang FS et al. reported (Zhang Cet al, 2020) that 2-11% of patients with COVID-19 have liver comorbidities, while 14-53% of patients with abnormal levels of ALT and AST, and the critical COVID-19 patients seem to have a higher rate of liver dysfunction. In this case, the patient had abnormal heart conditions, increased blood pressure, and hepatic dysfunction after intubation. However, they can be gradually improved via active and effective symptomatic treatment.

In general, for elderly patients with comorbidities, in the case of critical symptoms such as dyspnea and extreme decline of SaO₂, the active control of the progress of comorbidities, and early and timely assisted respiratory interventions may prevent the disease from progressing to adverse outcomes. In addition, for patients of COVID-19 with impaired liver function, stricter surveillance and targeted treatment are needed. The successful recovery of this patient has given great encouragement and confidence to clinicians. However, multiple factors contribute to COVID-19 pathology and its composite endpoint. More related research and reports are needed in the future.

Ethical Statement

All studies were approved by and performed according to the guidelines of the ethics committee at University

Hospital of Hubei University for Nationalities and Wuhan University (China).

Data Availability Statement

All data, models, and code generated or used during the study appear in the submitted article.

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Conflict of interest

No conflicts of interest were declared.

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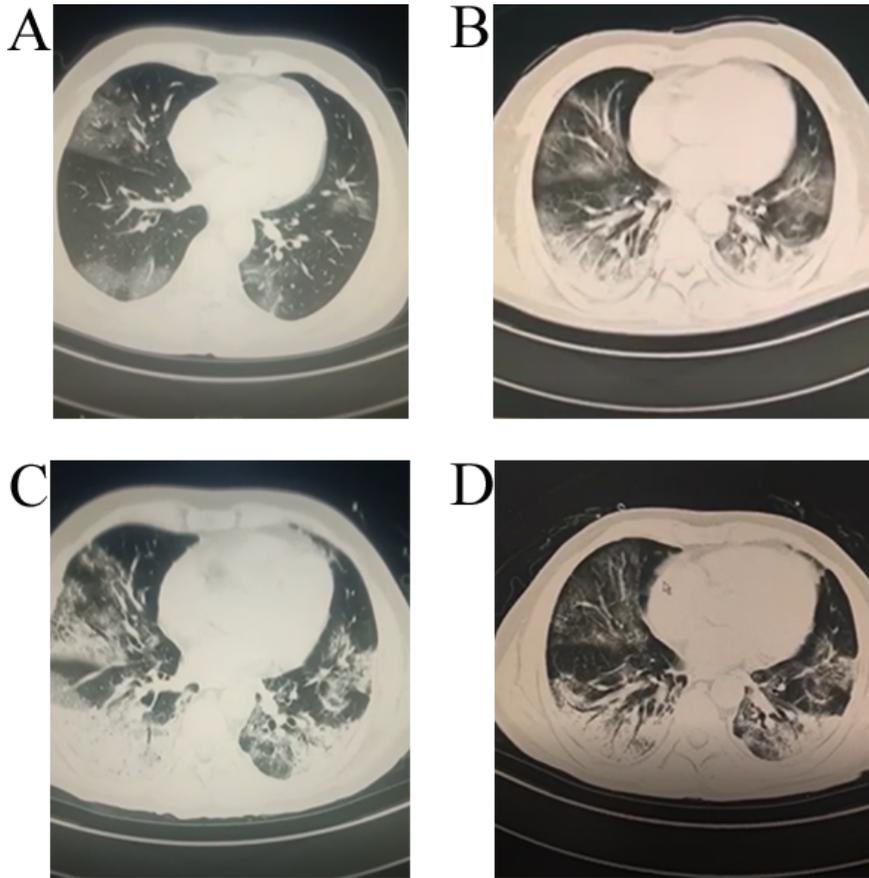
Tables

Table 1. Analysis of Clinical Characteristics and Laboratory Findings of this patient.

Figure Legends

Figure 1. Chest computed tomographic images of this patient of COVID-19 from outpatient department to discharge criteria were met. A. CT image before admission: right lung and left lung

lower lobe infectious lesions, multifocal ground glass changes. B. CT image on the 8th day after admission (2020.02.19 before tracheal intubation): multiple infectious lesions in the lungs, showing multifocal ground glass opacities with consolidation, the range is significantly larger than before, the density is higher than before, a few fibrous calcifications in the lungs. C. CT image on the 26th day after admission (2020.03.08 after removal of tracheal intubation): Multiple infectious lesions in the lungs show ground glass changes, the range is larger than the previous results and the density of some lesions is higher than before. D. CT image on the 36th day after admission (the second day of isolated observation on 2020.03.18): the absorption of bilateral ground glass opacity compared with the previous image.



	before admission	Day 1	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14	Day 15	Day 16	Day 17	Day 18	Day 20	Day 21	Day 22	Day 27	Day 30	Day 32	Day 33	Day 34	Day 36	Day 38	
Special state	2.10	2.12	2.16	2.17	2.18	2.19	2.20	2.21	2.22	2.23	2.24	2.25	2.26	2.27	2.28	2.29	3.02	3.03	3.04	3.09	3.12	3.14	3.15	3.16	3.18	3.20	
										Non-invasive ventilator	Tracheal intubation and Invasive ventilator						Removal of tracheal intubation								Meet discharge criteria		
SARS-CoV-2 nucleic acid tests	+	+																									
anti SARS-CoV-2 IgG																											
T °C		36.7	37.5	36.5	36.7	38.5	37.5	38.5	38	37.5	38.2	38.5															
neutrophil percentage %	64.6	75.5									94.1	96.4			81.2			90.1					44.7				
lymphocyte percentage %	25	15.6										2.3			15.2				17.3								
lymphocyte count (*10 ⁹ /L)		0.67									0.25	0.25						0.38		0.84	0.93	1.38			1		
C-reactive protein (CRP) mg/L													31	13	12			48	17	26	6.8						
D-dimer level mg/L												1.5	1.3	1.7				2.1	1.1	4	4.5				8.8		
ALT U/L		24									116	47	239	226				115		156	240	244	229	258	225		
AST U/L		36									39		168	89				46		121	144	141	131	122	90		
ALP 30-90 U/L											30.3									318	421	444	416	415	395		
γ-GT U/L											91			108						181	267	299	289	278	264		
PO2 mmHg								79.3	49.2	60.3	55.8	184	166								120				107		
SaO2 %								96.2	49.2	93.1	100	100	100	100	100	100	100			98	100		99	100	100		